12/23/16 "Hope is an accelerant."-Mrs. Lenoci

HW: "Synthetic Division of Polynomials" worksheet #2-10 even

AIM: How do we use Synthetic Division?

Warm Up:

1) Use long division to divide:

$$\left(2x^3-9x^2+10x-7\right)\div\left(x-3\right)$$

$$2x^2-3x+1+\frac{-4}{x-3}$$

$$x-3\,\overline{\big)\,2x^3-9x^2+10x-7}$$

$$-\left(2x^3-6x^2\right)$$

$$-3x^2+10x$$

$$-\left(-3x^2+9x\right)$$

$$x-7$$

$$-(x-3)$$

$$-4$$

Is there another way to find the quotient and remainder of the warm up?

Synthetic Division

$$\left(2x^3-9x^2+10x-7\right)\div\left(x-3\right)$$

Steps

1) First, write the coefficients ONLY inside an upside-down division symbol:

$$\begin{array}{|cccc} 2 & -9 & 10 & -7 \\ \hline \end{array}$$

2) Solve the divisor for x and place that value outside

$$x-3=0$$

$$x=3$$

$$\begin{array}{c|cccc} 3 & 2 & -9 & 10 & -7 \\ \hline \end{array}$$

3) Take the first number inside, representing the leading coefficient, and carry it down, unchanged, to below the division symbol:

$$\begin{array}{c|cccc} 3 & 2 & -9 & 10 & -7 \\ \hline & 2 & & & \end{array}$$

4) Multiply the outside value by the carry down value and place that number under the second coefficient

$$\begin{array}{c|cccc} 3 & 2 & -9 & 10 & -7 \\ & & 6 & & \\ \hline & 2 & & & \end{array}$$

5) Add down the column:

$$\begin{array}{c|cccc} 3 & 2 & -9 & 10 & -7 \\ & & 6 & & \\ \hline & 2 & -3 & & \end{array}$$

6) Multiply the result by the outside value and place the result under the third coefficient

$$\begin{array}{c|cccc} 3 & 2 & -9 & 10 & -7 \\ & & 6 & -9 & \\ \hline & 2 & -3 & 1 & \end{array}$$

7) Repeat the process until there are no columns remaining

$$\begin{array}{c|cccc} 3 & 2 & -9 & 10 & -7 \\ & & 6 & -9 & 3 \\ \hline & 2 & -3 & 1 & -4 \end{array}$$

8) The last value is the remainder and the remaining values are the coefficients of the quotient, right to left in ascending order

$$2x^2-3x+1+\frac{-4}{x-3}$$

Use Synthetic Division to find the quotient and remainder of the following:

1) $\left(x^3-2x^2-5x+6\right)\div\left(x-3\right)$

$x-3=0$
$x=3$

$$\begin{array}{r|rrrr} 3 & 1 & -2 & -5 & 6 \\ & & 3 & 3 & -6 \\ \hline & 1 & 1 & -2 & 0 \end{array}$$

$$\boxed{x^2+1x-2}$$

3) $\left(2x^3+x^2-3x+7\right)\div\left(x+1\right)$

$x+1=0$
$x=-1$

$$\begin{array}{r|rrrr} -1 & 2 & 1 & -3 & 7 \\ & & -2 & 1 & 2 \\ \hline & 2 & -1 & -2 & 9 \end{array}$$

$$\boxed{2x^2-1x-2+\frac{9}{x+1}}$$

5) $\left(x^4-3x^3+7x^2-2x+1\right)\div\left(x+2\right)$

7) $\left(3x^4+x^3-2x+3\right)\div\left(x+1\right)$

9) $\left(x^4-16\right)\div\left(x-2\right)$

$x=2$

$$\begin{array}{r|rrrrr} & & 0x^3 & 0x^2 & 0x & \\ 2 & 1 & 0 & 0 & 0 & -16 \\ & & 2 & 4 & 8 & 16 \\ \hline & 1 & 2 & 4 & 8 & 0 \end{array}$$

$$\boxed{x^3+2x^2+4x+8}$$

all points are (x, y)
when we use x we get an answer
The answer is y (or $f(x)$)
The answer is also the remainder when we divide

Roots have no remainder so all points are $(x, 0)$
All other points are (x, remainder)